

A new species of *Pisione* (Polychaeta: Pisionidae)  
from Shijiki Bay, Nagasaki Prefecture, western Japan

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長崎県志々伎湾から発見されたピシオネ属（環形  
動物：多毛綱：ピシオネ科）の1新種

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抄録：平戸市の志々伎湾の砂底から発見されたピシオネ属の1新種を *Pisione subulata* と命名し、記載した。本種は、疣足の背足刺の先端部が体壁を貫いて外在するという特徴を有している点で、本属のすべての既知種と区別される。また、握りこぶし状の雄性交尾器官の形態も、この器官が記載されている既知種においては知られていない。

**Abstract :** *Pisione subulata* n. sp. from sandy bottoms of Shijiki Bay, Hirado Island is described. The new species is distinguished from all previously known species of the genus in having notoacicula whose distal part project outwards piercing the body wall. Fist-shaped male copulatory organ observed on the present species is also peculiar in the genus so far as the organ is known.

**Key Words :** *Pisione subulata*; Polychaeta; new species; Shijiki Bay, Japan.

Nineteen species and one subspecies of the genus *Pisione* have been recorded mostly from sandy sediments of world-wide localities. In Japan, three species of the genus *Pisione* have been recorded from intertidal or subtidal sediments (Yamanishi, 1976; Uchida, 1988). From bottom sediments, however, only an unidentified species has been known so far (Yamanishi, 1979).

From samples collected at a benthos survey of Shijiki Bay, Hirado City, Nagasaki Prefecture, western Japan in 1984, many individuals of *Pisione* including several mature males bearing copulatory organs were brought to the author's hand.

This paper deals with the results of the examination of the materials. It is the first full description of a bottom-dwelling species of *Pisione* in Japanese waters.

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**Family Pisionidae Southern, 1914****Genus *Pisone* Grube, 1856*****Pisone subulata* n. sp.**

(Tables 1-3; Figs. 1-3; Plate 1,figs.1-10)

**Materials Examined** (for size see Tables 1-3)

Samples were collected at a benthos survey of Shijiki Bay which was carried out by the Seikai Regional Institute of Fishery Research. They were brought to the author as ethanol-immersed specimens after fixed by formalin.

The holotype is a mature male collected from a sandy bottom of 28m deep, 33° 12' 51" N, 129° 22' 06" E on May 10, 1984.

Eight paratypes are composed of 4 mature males and 4 sexually indeterminable individuals from sandy bottoms of 16-35m deep, in the range of 33° 11' - 33° 12' N, 129° 21' - 129° 22' E, on May 10-11, 1984.

The type series are deposited in the Osaka Museum of Natural History, registered in the numbers of Iv 1228 (holotype) and Iv 1229-1236 (paratypes); they are preserved in 70% ethanol.

An incomplete, mature male with well-developed copulatory organs was prepared for SEM observations; it is not preserved.

**Diagnosis**

Body length up to 11.2mm. Number of setigers up to 64. Prostomium recognized as a sub-diamond shaped structure surrounded by buccal segment. Stout, buccal acicula project anteriorly piercing the body wall. Ventral cirri of the 1st setiger elongated. Dorsal cirri of

Table 1: Morphometric data for the type series

Registration Number	#1228*	#1229**	#1230**	#1231**	#1232**	#1233**	#1234**	#1235**	#1236**
Sex	male	male	male	male	male	?	?	?	?
Body length (mm)	6.3	7.0	4.5	>6.0	>3.8	5.4	11.2	10.6	8.1
Number of setigers	43	54	34	>36	>23	41	64	64	49
Position of copulatory organs (setigers)	14-17th	15-18th	14-18th	14-18th	14-16th				
Position of emerging noto-acicula (setigers)	6-41st	6-?th	7-33rd	7-?th	12-?th	4-41st	7-63rd	11-63rd	6-49th
Position of acicular setae (setigers)	9-41st	?-?th	11-34th	9-?th	9-?th	11-38th	11-62nd	10-61st	9-45th

\*holotype, \*\*paratype.

the 2nd setiger not elongated. Distal parts of notoacicula project outwards piercing the body wall. Each bundle of setae is composed of one simple seta with obliquely truncated edge, one long-bladed falciger, one acicular seta, one or two short-bladed falcigers with serrated edge, and one short-bladed falciger with smooth edge, being arranged dorso-ventrally in this order. Male copulatory organs start from the 14th or 15th setiger continuing through 3–5 segments. They are fist-shaped terminally with many papillae. Ventral cirri of parapodial lobes are also elongated on those segments.

## Description

### Habitus

An elongated, slender worm with a maximal length of 11.2mm (Table 1; Pl.1, fig.1). Body is composed of a buccal segment, numerous setigerous segments (setigers) and an anal segment. Number of setigers reached 64 (Table 1). Body is widest at the middle segments maximally with 0.29mm on the holotype excluding parapodia (Table 2). It tapers posteriorly at the last several segments (Table 2).

Parapodia are well developed. The length of a parapodial lobe exceeds half the width of the trunk of the same segment at the middle segments (Table 2).

Trunk is nearly flat dorsally and slightly convex ventrally.

### Colour

White in ethanol.

### Anterior Part

The degenerated prostomium, characteristic in most species of this genus, is recognized as a small, somewhat rhomboid structure surrounded by the buccal segment (Fig.1a).

Brain extends from the position of posterior half of the prostomium to that of the border of the 3rd and 4th setiger. Though united just behind the prostomium, it is separated into bilateral lobes thereafter (Fig.1a).

A pair of eyes each composed of two overlapped eye spots are borne on the brain at the position of the 2nd setiger (Fig.1a).

A pair of long, stout palpi project anteriorly (Table 3; Fig.1a). Each of their bases is supported by a sheath which is situated anteriorly to the first setiger (Fig.1b).

Just behind the sheath opens the mouth where a proboscis protrudes (Fig.1b).

Table 2: Morphometric data for the body width and the parapodial length of the holotype (mm)

Position (setiger)	1st	2nd	3rd	4th	5th	10th	15th	20th	25th	30th	35th	40th	41st	42nd	43rd
Body width <sup>1)</sup>	0.23	0.25	0.26	0.25	0.26	0.24	0.29	0.24	0.25	0.23	0.21	0.15	0.15	0.13	0.06
Length of parapodial lobe <sup>2)</sup>	0.07	0.11	0.11	0.14	0.16	0.16	0.15	0.18	0.16	0.16	0.16	0.13	0.13	0.13	0.09

<sup>1)</sup>excluding parapodia, <sup>2)</sup>excluding setae.

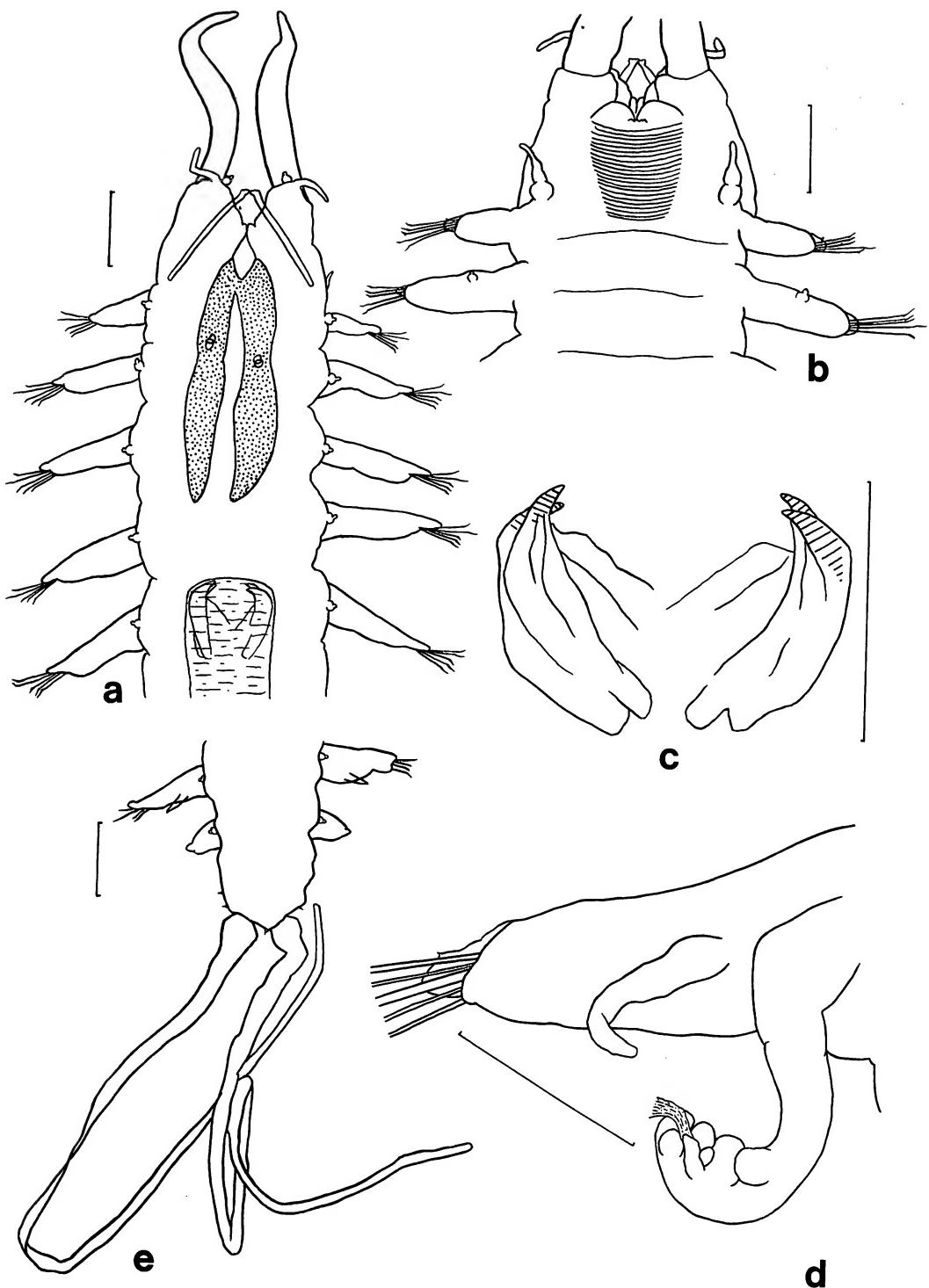


Fig.1. *Pisione subulata* n. sp. **a-d**, holotype; **e**, paratype (Iv 1234). **a**, anterior part, dorsal view; **b**, anterior part, ventral view; **c**, jaws; **d**, male copulatory organ on 15th setiger, posterior view; **e**, posterior end, dorsal view. Scales: 0.1mm.

The buccal segment, which is derived from the first body segment and composed of some modified parapodial elements, is developed over the palpal sheath. Its main, paired lobes project anteriorly each attaching an elongated, dorsal cirrus and a flask-shaped, ventral cirrus distally (Table 3; Fig.1a). Each of the lobes is supported by an obliquely orientated, stout aciculum (buccal acicula) whose distal part pierces the body wall (Fig.1a). The tips of the buccal acicula are slightly constricted subdistally and terminate in a flat, irregularly serrated edge (Fig.3a).

The detailed shape of the proboscis is unknown because it could not be observed under a protruded condition. Four chitinous jaws, however, were recognized through transmitted light as withdrawn into the pharynx at the position of the 5th setiger on the holotype (Fig. 1c). They are curved and coloured amber distally, but they are basally so thin that their outlines are indistinct though seeming to extend widely.

The ventral cirri of the 1st setiger are elongated being as long as the dorsal ones of the buccal segment (Table 3; Fig.1b). The dorsal cirri of the 2nd setiger, elongated in some species of the genus, are flask-shaped with the same shape and size as those on the succeeding segments (Table 3).

Table 3: Morphometric data for the cephalic appendages of the holotype (mm)

Appendage	Length
Dorsal cirrus of buccal segment	0.08
Ventral cirrus of buccal segment	0.01
Buccal acicula	0.16
Palp	0.31
Dorsal cirrus of 1st setiger	0.01
Ventral cirrus of 1st Setiger	0.08
Dorsal cirrus of 2nd setiger	0.01
Ventral cirrus of 2nd setiger	0.01

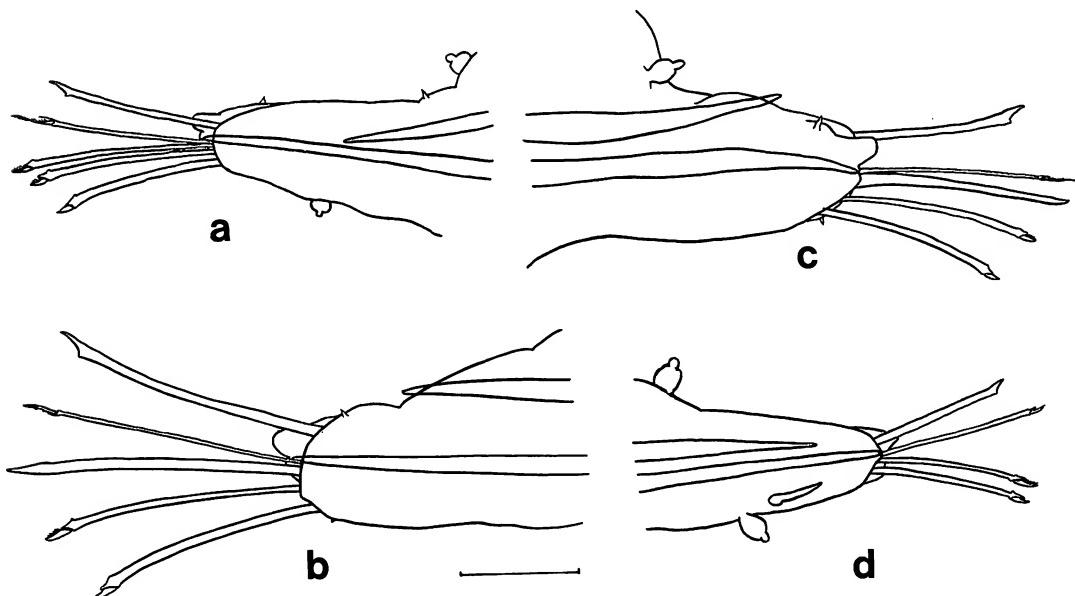


Fig.2. Parapodia of *Pisone subulata* n. sp., holotype. **a**, 3rd setiger, posterior view; **b**, 18th setiger, posterior view, both dorsal and ventral cirri detached; **c**, 36th setiger, anterior view, ventral cirrus detached; **d**, 42nd setiger, posterior view. Scale: 0.1mm.

*Parapodia*

The parapodial lobe of the 1st setiger is prominently small (Fig.1a); it abruptly enlarges at the 2nd setiger then gradually continues to enlarge on anterior segments; the size decreases

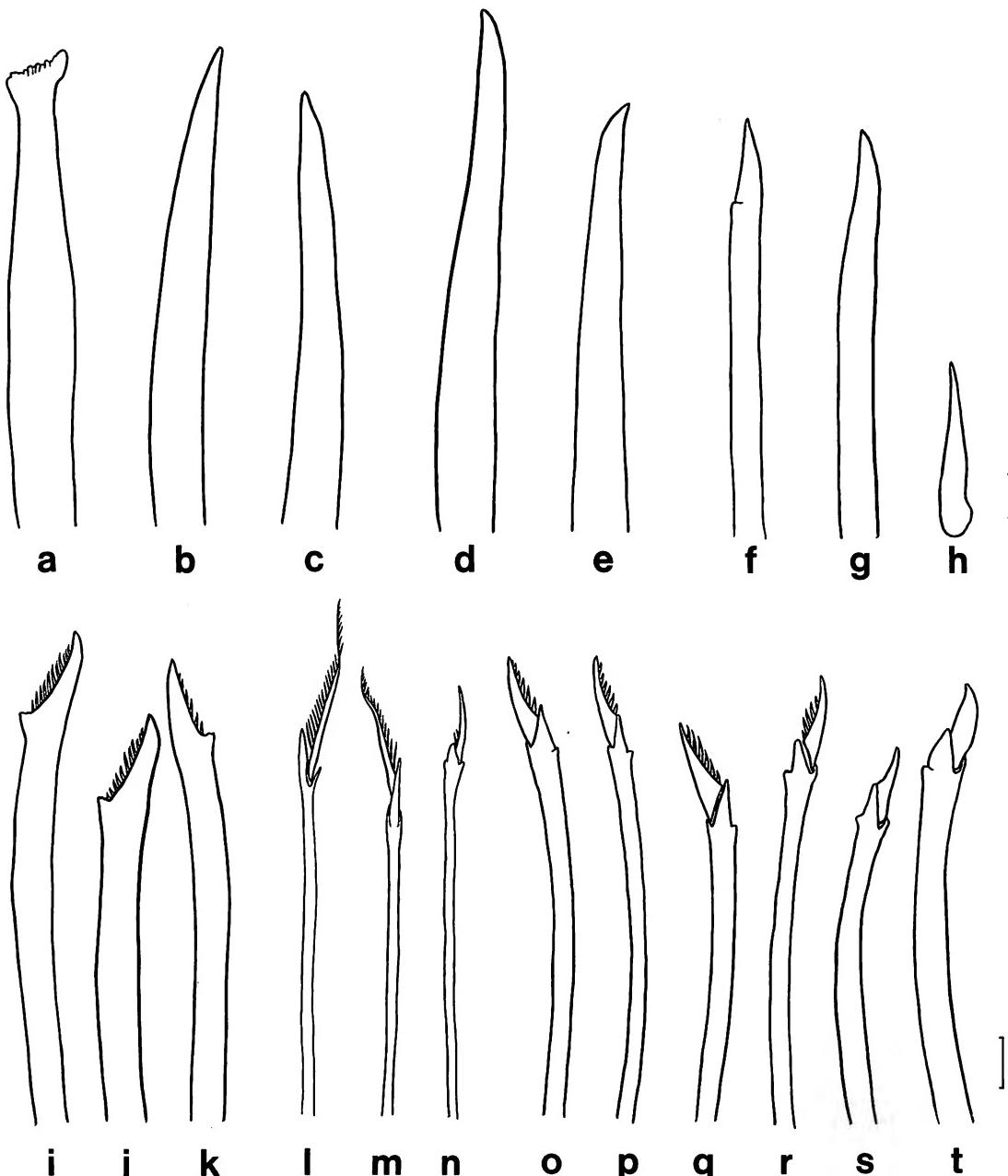


Fig.3. Setae of *Pionae subulata* n. sp., holotype. **a**, buccal acicula; **b**, notoacicula (24th setiger); **c**, same (36th); **d**, neuroacicula (24th); **e**, same (36th); **f**, acicular seta (11th); **g**, same (36th); **h**, rudiment of acicular seta (42nd); **i**, simple seta with truncate edge (7th); **j**, same (24th); **k**, same (42nd); **l**, long-bladed falciger (2nd); **m**, same (24th); **n**, same (42nd); **o**, short-bladed falciger with serrated edge (3rd, superior); **p**, same (3rd, inferior); **q**, same (24th); **r**, same (42nd); **s**, short-bladed falciger with smooth edge (2nd); **t**, same (42nd). Scales: 0.01mm.

on several posterior segments (Table 3).

Notopodium is reduced, represented only by a thick acicula (notoaciculum) whose tip is straight and emerges postero-dorsally piercing the body wall of the parapodial lobe (Fig.2b, c; Pl.1, figs.2,3) on every segment except for several anterior and a few posterior ones (Table 1; Fig.2).

Neuropodium is well developed constituting the main part of the parapodial lobe (Fig.2).

It is supported by an embedded aciculum (neuroaciculum) which is nearly the same size as the notoaciculum (Pl.1, fig.3); the tip usually bends down slightly (Fig.3d,e).

The neuropodium bears a bundle of setae.

Its presetal lobe has a supra-acicular process, while the postsetal one has a round lateral margin (Fig.2c).

Several palpocils are scattered on the surface of the parapodial lobe (Fig.2a-c).

The dorsal and ventral cirri of the parapodia are both flask-shaped and equal in size on every segment, except that the dorsal ones of the buccal segment, the ventral ones of the 1st setiger and the ventral ones of the male copulatory segments are more or less elongated. The dorsal cirri are attached onto the trunk just above the base of the parapodial lobe, whereas the ventral ones are hung at the midway of the ventral margin of the lobe (Fig.2a,d).

#### *Setae*

Each bundle of setae is composed of one simple seta with obliquely truncated edge, one long-bladed falcigerous seta (falciger), one acicular seta, and two or three short-bladed falcigers. They are arranged dorso-ventrally in this order (Fig.2).

The simple seta with an obliquely truncated edge, borne on every setiger, is situated in supra-acicular position. It looks stout. Its edge faces ventrally with serration of teeth of unequal lengths (Fig.3i-k; Pl.1, fig.6).

The rest of the setae are situated in infra-acicular position, and blades of falcigers here face dorsally (Fig.2).

The long-bladed falciger, present on every setiger, is situated just beneath the aciculum. It is very thin and fragile. Its shaft is heterogomph. In anterior segments, the blade is slender with dense, fine serrations and sometimes twists subterminally (Fig.3l,m; Pl.1, fig.7); the terminal process of the shaft is prominently slender. In posterior segments, the length of the blade decreases, and the terminal process accordingly becomes weak (Fig.3n).

The acicular seta is situated just beneath the long-bladed falciger. It appears from about the 9th setiger and continues to the posterior end though sometimes lacking on the last few segments (Table 1). It is as thick as the simple seta with the truncated edge. Its end, however, is straight and acutely pointed (Fig.3f,g; Pl.1, fig.8). Though this shape is similar to that of an aciculum, it neither arises from a deep portion of the parapodial base, nor muscularly controlled, as in the case of the true aciculum. It arises from the same level of parapodial lobe as the other kinds of setae (Pl.1, fig.3). The outline of this seta is slightly concave subterminally at one side and, in many cases, a shallow, transverse ridge is recognized. Though this seta lacked the penultimate setiger of the holotype, an embedded, thick

element of a seta, presumably a rudimentary stage of the seta in question, was observed at the mid-ventral side of the parapodial lobe (Figs.2d, 3h).

The short-bladed falcigers are heterogomph with a prominent subterminal transverse ridge on their shafts. They are classified as two types by the shape of their blades; one is serrated and the other is smooth. The former type is counted two on a parapodium of several anterior setigers a little before the start of the acicular seta (Fig.2a), then the number reduces to one continuing to the last setiger (Fig.2b-d). Its serration is rather coarse and 4-8 teeth are counted on a blade (Fig.3o-r; Pl.1, fig.9). The latter is always situated inferior to the former and counted one throughout the body (Fig.3s,t; Pl.1, fig.10). The shaft of the latter is thicker than that of the former.

#### *Male Copulatory Organ*

The male copulatory organ is a secondary structure derived from a bulge of the nephridial opening situated at the ventral side of the basal part of the parapodial lobe (Fig.1d; Pl.1, fig. 3). They were observed to start from the 14th or 15th (mostly 14th) setiger irrespective of their number of body segments and continue through 3-5 setigers forming a replicated series (Table 1). They are borne on both sides of the segments (Pl.1, fig.4) and direct ventrally. Terminally, the organ curves and swells presenting a fist-like appearance. The inside of the "fist" is crowded with several globose papillae of various sizes though its detailed view, taking the internal structure into consideration, has not been clarified yet. Among the papillae projects outwards a ribbon-like structure. There is a distinct, subterminal papilla at an interval from the "fist". Additionally, the ventral cirrus of the parapodium is so elongated that it reaches nearly half the length of the copulatory organ, presumably serving as assistant at copulation.

The rest of the parapodial elements, that is, the main parapodial lobe, dorsal cirrus or setae, are not modified on these segments.

#### *Posterior End*

The last, anal segment is a setigerous bearing a pair of anal cirri (Fig.1e). In the present study, however, they are mostly detached. They are thread-like and remarkably long, exceeding 1mm on a specimen with a body length of 11.2mm.

#### **Remarks**

Of the known species of the genus *Pisione*, such characters as the elongated ventral cirri of the 1st setiger, the flask-shaped dorsal cirri of the 2nd setiger, and the possession of simple, acicular setae are shared with *P. remota* Southern, 1914, *P. puzae* Siewing, 1953 and *P. levisetosa* Zhao et al., 1991.

Among them, the present material is closely related to *P. levisetosa* which is the only species known to possess the short-bladed falcigers with smooth edge. The former, however, is characteristic in having the notoacicula that distally project through the body wall, which has not been known from any species of the genus. The emerging tips of the notoacicula are

conspicuous and look like those of needles, hence the new name “*subulata*”. The fist-like male copulatory organ observed on the present species is also peculiar in the genus so far as the organ is known.

It is convincingly noted that the projection of the notoacicula piercing the body wall can by no means be interpreted as any kind of deformation, for example, caused by shrinkage of the parapodial lobes on fixation because another, unexamined species of *Pisone* found mingled in the present material showed no sign of such projection.

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**Explanation of Plate 1*****Pisione subulata* n. sp.**

1. Entire worm; anal cirri detached.
2. Parapodium of 40th setiger, dorsal view.
3. Parapodium of 36th setiger, posterior view.
4. Copulatory organs, antero-ventral view.
5. Copulatory organs on 14-17th setigers, dorsal view.
6. Simple seta with truncate edge of a middle segment.
7. Long-bladed falciger of a middle segment.
8. Acicular seta of a posterior segment.
9. Short-bladed seta with serrated edge of an anterior segment.
10. Short-bladed seta with smooth edge of an anterior segment.

Figs.1-3 and 5 are transmitted light micrographs of the holotype.

Figs.4 and 6-10 are SEM photos of a specimen prepared apart from the type series.

Scale for fig.1: 1mm; scales for figs.2, 3 and 5: 0.1mm; scales for figs.6-10: 0.01mm.

Plate 1

